NBS-GCR-78-149

Analysis of Fire Reports on File in the Massachusetts State Fire Marshal's Office Relating to Wood and Coal Heating Equipment

J. W. Shelton

November 1978

Issued February 1979

Sponsored by

U.S. Department of Commerce
National Bureau of Standards
Washington, DC 20234

and

U.S. Department of Energy
Division of Fossil Fuel Utilization
Washington, DC 20545

NBS-GCR-78-149

ANALYSIS OF FIRE REPORTS ON FILE IN THE MASSACHUSETTS STATE FIRE MARSHAL'S OFFICE RELATING TO WOOD AND COAL HEATING EQUIPMENT

J. W. Shelton

36 Hawthorne Road
Williamstown, MA 01267

November 1978

NBS Contract No. NB79NAAA1576

Issued February 1979

Sponsored by
Center for Fire Research
National Bureau of Standards
Washington, DC 20234

and

U.S. Department of Energy
Division of Fossil Fuel Utilization
Washington, DC 20545

Analysis of Fire Reports on File in the Massachusetts State Fire Marshal's Office Relating to Wood and Coal Heating Equipment

Jay W. Shelton, Ph.D.
Wood Heating Consultant
36 Hawthorne Road
Williamstown, Massachusetts 01267

November, 1978

Notice

This report was prepared for the Center for Fire Research of the National Engineering Laboratory, National Bureau of Standards, under Contract No. NB79NAAA1576. The statements and conclusions contained in this report are those of the author and do not necessarily reflect the views of the National Bureau of Standards or the Center for Fire Research.

Abstract

An analysis of solid-fuel related fires reported by local fire departments to the Massachusetts State Fire Marshal's Office from late 1977 through June, 1978 indicates that of the fires attributed to specific causes, roughly 3/4 were attributed to unsafe installations, and about 1/4 were attributed to unsafe operation/maintenance. In less than 2 percent of the fires was the cause attributed to defects or poor design in the heating appliance itself. Thus, to the extent that the local fire department reports are complete and reliable, it appears that attention to installation, operation and maintenance is what has the most potential for reducing fires.

Preface

This report was funded by the National Bureau of Standards (NBS), Center for Fire Research (CFR), as a part of the NBS investigation of fire safety of wood-heating equipment sponsored by the Department of Energy.

In this study reports from local fire departments to the Massachusetts State Fire Marshal's Office concerning wood-stove related fires are analyzed for the probable specific cause of the fire. The results may be useful for indicating in which areas preventative actions could be most effective.

For approximately the last year, the Massachusetts State Fire Marshal's Office has been keeping a separate file of all solid-fuel-heating related fires reported to the state office by the local fire departments. As of June, 1978, there were about 104 reports on file, mostly covering fires which occured during the 77 - 78 heating season.

These reports were analyzed for the probable cause of the fire, the objective being to ascertain the percentage of fires attributable to the following three catagories of causes: installation (chimneys, chimney connectors, floor protection, clearances, etc.), operation / maintenance, and defects or poor design in the heating unit itself.

The reports themselves appear for the most part, to be cursory. Many local fire departments do not have the expertise and / or time to conduct a thorough investigation. These reports were essentially taken at face value in this analysis.

Of the 104 reported fires relating to wood and coal heating systems, 74 were attributed by the local fire departments to a specific cause i.e., more specific than "wood stove" or "overfired wood stove." These 74 cases are further broken down in Table 1. Of these 74 cases, 71 percent were attributed to faulty installations, 16 percent were apparently due to poor maintenance (e.g., chimneys not kept clean and furniture and rugs not kept at safe distances from stoves), 11 percent were attributed to operator errors and one single fire was attributed to a "defective stove" with no details given. Since in this fire the house burned to the ground it is not clear how the determination was made that a defect in the stove caused the fire.

The implication of the sample of reports is clearly that defects and faults in the heaters themselved are not a major cause of fires. The most important area of concern for preventing fires seems to be installations, with operation / maintenance being the other important area.

Table 1.

Reported Cause[1]	No. of Cases	Approximate % of all reported fires	Approximate % of fires for which a usefully specific cause was given
Improper Installations			
not specific	6		
Stove			
not specific	7		
clearances	8		
Stovepipe connector			
not specific	7	53 cases 51%	71%
clearances	9		
joints not fastened	2		
Chimney			
not specific	7		
clearances	3		
cracked chimney	1		
no (or inadequate) liner	3		
Lack of maintenance			
creosote buildup and/or chimney fire	11	12 cases 11%	16%
clearances to furniture not maintained	1		

Table 1. (cont.)

Reported Cause[1]	No. of Cases	Approximate % of all reported fires	Approximate % of fires for which a usefully specific cause was given
Negligent operation			
"Wood shingles drying on top of stove."	1		
"Door may have been left ajar."	1		
"...new mattress... was leaning against the kitchen wall next to a wood stove. Evidently a spark from the stove ignited the mattress, which in turn ignited the rug and floor."[2]	1		
"Possibly started in area where ashes from a wood stove were dumped. Wood ashes stored in a cardboard container."	1	7 cases 7%	11%
"Probable spark from a wood stove igniting combustibles on wall next to stove."[2]	1		
"Spark from wood burning stove ignited overstuffed chair and scorched parlor floor."[2]	1		
"Overheated wood stove and overheated flue pipe. Woman of house filled stove with wood and went to town leaving damper wide open...Stove was very good model and the installations appeared to be very satisfactory. I must believe that this fire was caused by human error other than faulty installation or equipment."	1		

Table 1. (cont.)

Reported Cause[1]	No. of Cases	Approximate % of all reported fires	Approximate % of fires for which a usefully specific cause was given
Defective or unsafe equipment			
"Defective wood stove. Home completely destroyed."	1	2 cases 2%	2%
"Steam explosion of water heating jacket in antique cook stove."[3]	1		
Other (e.g. "Wood stove.")		30 cases 29%	
		104 cases 100%	100%

[1]In cases where 2 or more possible causes were given or implied, I have selected what I consider the more fundemental cause. E.g., one report reads "Overheated chimney connector from wood stove ignited combustible wall." I interpreted this as a case of inadequate clearance between the stovepipe and the wall, since with proper clearances, even overheated stovepipe is very unlikely to ignite combustible walls.

[2]I have assumed sparks got out because a spark screen was not in use when the doors of a Franklin type stove were open. Other interpretations are: 1) inadequate clearances to walls and furnishings, and 2) unsafe stoves which let sparks out with doors shut.

[3]This case might also reasonably be interpreted as due to operator error -- firing up a stove with a capped water jacket with water in it.

Table 1. Fires and other accidents related to the use of wood heating equipment in Massachusetts on file in the State Fire Marshal's Office as of June 26, 1978, covering most of (and mostly) the 1977-78 heating season. The total sample is 104 reports, 74 of which gave usefully specific causes. Determining causes of fires is difficult, particularly when the building is totally destroyed. Many of these local fire department reports are admittedly only educated guesses.

NBS-114A (REV. 7-73)

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. NBS-GCR-78-149	2. Gov't Accession No.	3. Recipient's Accession No.

4. TITLE AND SUBTITLE

Analysis of Fire Reports on File in the Massachusetts State Fire Marshal's Office Relating to Wood and Coal Heating Equipment.

5. Publication Date

November 1978

6. Performing Organization Code

7. AUTHOR(S)

J.W. Shelton

8. Performing Organ. Report No.

9. PERFORMING ORGANIZATION NAME AND ADDRESS

36 Hawthorne Road
Williamstown, MA 01267

10. Project/Task/Work Unit No.

11. Contract/Grant No.

NB79NAAA1576

12. Sponsoring Organization Name and Complete Address (Street, City, State, ZIP)

National Bureau of Standards
Department of Commerce
Washington, DC 20234

13. Type of Report & Period Covered

14. Sponsoring Agency Code

15. SUPPLEMENTARY NOTES

16. ABSTRACT *(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)*

An analysis of solid-fuel related fires reported by local fire departments to the Massachusetts State Fire Marshal's Office from late 1977 through June, 1978 indicates that of the fires attributed to specific causes, roughly 3/4 were attributed to unsafe installations, and about 1/4 were attributed to unsafe operation/maintenance. In less than 2 percent of the fires was the cause attributed to defects or poor design in the heating appliance itself. Thus, to the extent that the local fire department reports are complete and reliable, it appears that attention to installation, operation and maintenance is what has the most potential for reducing fires.

17. KEY WORDS *(six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons)* Accident investigations; chimneys; coal; creosote; fire departments; fire safety; heating equipment; maintenance; stoves; wood

18. AVAILABILITY

[X] Unlimited

[ ] For Official Distribution. Do Not Release to NTIS

[ ] Order From Sup. of Doc., U.S. Government Printing Office Washington, D.C. 20402, SD Cat. No. C13

[XX] Order From National Technical Information Service (NTIS) Springfield, Virginia 22151

19. SECURITY CLASS (THIS REPORT)	21. NO. OF PAGES
UNCLASSIFIED	9
20. SECURITY CLASS (THIS PAGE)	**22. Price**
UNCLASSIFIED	$4.00